DOCUMENT RESUME

ED 199 195 SP 017 509

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TITLE Academic Characteristics of Student Teachers and Cognitive Attainment of Their Learners.
INSTITUTION Texas A and M Univ., College Station. Coll. of Education.
PUB DATE Feb 81
GRANT OUR-TAMU-1530-1000
NOTE 19p.: Paper prepared for the Annual Meeting of the Association of Teacher Educators (Dallas, TX, February 17, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; *Achievement Rating; Course Content; *Grade Point Average; Higher Education; *Majors (Students); *Performance Factors; Preservice Teacher Education; Secondary School Students; Secondary School Teachers; *Student Improvement; *Student Teachers; Teacher Effectiveness; Teacher Evaluation

ABSTRACT

This study investigated the relationship between the academic background of student teachers and the performance of their students in a secondary school field site. Three assessment models were used to determine the following: (1) whether student academic performance is influenced by the teaching field of the student teacher; (2) whether the quantity of professional education coursework completed by student teachers affects the quality of their teaching; and (3) the influence of the student teacher's grade point average in academic courses on the academic achievement of the class. Results indicated that learner cognitive attainment is relatively stable across different student teacher teaching fields. There was an observed difference in learner performance favoring student teachers majoring in education. It was found that a student teacher's grade point average in college coursework was a poor predictor of the student teacher's ability to bring about cognitive growth in learners. (JD)

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Academic Characteristics of Student Teachers and Cognitive Attainment of Their Learners

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This paper was prepared for the 1981 annual meeting of the Association of Teacher Educators in Dallas, Texas, Feburary 17, 1981. Funding for this research was obtained from the organized research fund, College of Education, Texas A&M University. (OUR-TAMU-1530-1000).

The competence of freshly minted teachers and the value of teacher preparation programs that have produced them are being critically questioned today by many segments of society. The profession itself is engaged in self-anlysis and describing the need for reform (Smith, 1980; Drummond & Andrews, 1980; Peseau & Orr, 1980). Perhaps this is a reaction to recent essays appearing in print. (Mitchell, 1978; Lyons, 1980) or to personal observations that the institution of teacher preparation isn't what it ought to be.

These factors have undoubtedly influenced our thinking resulting in an objective to determine whether learner cognitive attainment data are influenced by academic characteristics of the student teacher. Inherent in this objective are concerns regarding the content preparation of the candidate as well as the quantity of professional education coursework completed prior to student teaching. Watts (1980) decries the grade point standards commonly used as admission criteria into teacher preparatory programs as being embarrassingly low. This concern is based on the assumed link between course grades and knowledge. Knowledge of the teacher and the subject being taught have been shown to influence the achievement of learners (Coleman, 1975; Denton, Kracht, & McNamara, 1980).

On another issue, Smith & Street (1980) cite statistics on the meager quantity of coursework in professional education needed for teacher certification. They note that professional instruction for licensing a barber in Florida exceeds that of teacher certification in twenty-two states. These disparaging observations regarding the criteria associated with teacher education and the extent of the preparatory programs once a candidate is admitted imply that teacher effectiveness and corresponding learner cognitive attainment are being adversely affected by current requirements for becoming a teacher. Linking characteristics of the

student teacher, such as grade point ratios in teaching fields, grade point ratio in professional education, and quantity of professional education coursework completed, with cognitive attainment of learners taught by the student teacher may provide empirical support for reforming teacher education programs.

Collecting learner cognitive attainment data on learners of student teachers is another matter. Yet an evaluation strategy developed by McNeil and Popham (1973) does provide guidelines for accomplishing this task without disrupting the instructional program of the host school or the student teaching program. This approach is based on the notion that the objectives of the instructional plan must be agreed on before teacher competency can be assessed. Supervisors and the teaching candidate must agree on the appropriateness of stated performance objectives for the learners. Further, agreement is reached before instruction begins regarding what evidence will be used to determine whether the teaching has resulted in learner attainment of the performance objectives. Data are subsequently collected to determine whether learners have achieved the stated objectives as well as whether unintended outcomes have emerged. The evaluation plan need not exclude the use of observational systems in the assessment of instruction, rather this plan recommends their use as means for establishing descriptive records of the teaching act.

One significant advantage of the contract plan for assessing teacher competence is that it allows student teachers in conjunction with their supervisors to establish outcomes and standards that are most appropriate for their learners. Prior learning, dynamics of the classroom, and classroom environment can be taken into account in establishing the instructional plan on which the student teacher is to be held accountable (McNeil & Popham, 1973).

Restating the objective of this inquiry as research questions has resulted in the following questions:

1. Do differences occur when learner cognitive attainment values are compared among teaching candidates of different teaching fields?

2. Do differences occur when learner cognitive attainment values are compared between teaching candidates majoring in education and those not majoring in education?

3. Do grade point ratios (teaching fields, professional education) of teaching candidates predict learner cognitive attainment of instructional objectives taught by the candidate?

ORGANIZATION OF INVESTIGATION

Program Description

This investigation was conducted in the educational curriculum and instruction department at Texas A&M University. The teacher preparation program which participated in the investigation is a competency based program for secondary level teachers fashioned around a diagnostic prescriptive model of instruction (Armstrong, Denton, Savage, 1978). This model conceptualizes teaching as a series of events requiring five distinct sets of instructional skills, that is: Specifying Performance Objectives, Diagnosing Learners, Selecting Instructional Strategies, Interacting with Learners, and Evaluating the Effectiveness of Instruction.

A full semester-full day student teaching program with twelve semester hours being awarded for successful completion of the course is the culminating experience in this preparation program. During this experience, each student teacher is required to develop and implement two instructional units each of approximately two weeks duration. The instructional units are to include: performance objectives, a diagnostic pretest to determine whether prerequisite knowledges and skills are present, instructional strategies addressed to each performance objective, and criterion-referenced instruments. These units must be deemed acceptable and appropriate by both the classroom supervising teacher and the university supervisor prior to implementation.

Some time ago, a multi-stage evaluation system was established to monitor the development and implementation of this competency based program (Denton, 1977). Evaluation of student teachers in this system includes supervisor ratings based on in-class observations and ratings of instructional materials produced by the student teacher. Generally, six supervisor ratings are completed during a semester. These ratings are recorded on an Evaluation Profile instrument. It may be of significance that the final evaluation for each student teacher recorded on this instrument represents a consensus rating resulting from a three-way conference between the student teacher, classroom supervisor and university supervisor. In addition, a Curriculum Context Checklist for rating the components of each instructional unit is completed by the university supervisor. Two of these forms are completed during the course of the field experience.

Student teachers are also requested to contribute to the formative evaluation process by completing weekly reflection sheets throughout the semester. Further, summative procedures are conducted by student teachers at the conclusion of each unit, where summaries of learners' performances are recorded on Summary Evaluation of Unit Forms. These self-evaluation experiences are consistent with the final component of the diagnostic-prescriptive model of instruction.

Only one type of data was collected for this investigation which ordinarily is not collected during student teaching, that being, criterion referenced learner attainment data. In this investigation, student teachers retained the unit test responses of learners after providing feedback to the learners regarding their performance. These data were subsequently used to develop a criterion-referenced summary on each learner. This summary is a record of each learner regarding his/her individual performance with respect to each performance objective included in the

unit. In addition, pretest and posttest scores were recorded for each learner on the summary. The objective attainment data expressed as the percentage of objectives attained in unit two for each learner have served as the dependent variable in this investigation.

Sample

Information from 82 secondary level student teachers and 9001 learners taught by the student teachers comprised the total sample for this data base. These student teachers were supervised by 5 university supervisors over the course of five semesters, i.e. Spring 1978 - 7 student teachers, Fall 1978 - 18 student teachers, Spring 1979 - 19 student teachers, Fall 1979 - 9 student teachers, Spring 1980 - 29 student teachers. The total number of secondary level student teachers numbered 291 during this period (Spring 78 - 68, Fall 78 - 64, Spring 79 - 52, Fall 79 - 52, Spring 80 - 55).

In order to enroll in student teaching each student teacher in this sample had met the following criteria:

1. Attained senior standing . . .
2. Attained a minimum grade point ratio of 2.25
3. Completed at least 75 percent of the coursework required for two teaching fields with a minimum grade point ratio of 2.25.
4. Admitted to teacher education program at least one semester prior to student teaching. The criteria for this standard include a statement of personal commitment, minimum grade point ratio (2.25), three letters of recommendation, successful completion of English proficiency examination, and *early field exp. course.(*only required for Education Majors).
5. Completed ten hours of professional education coursework.

The learners in this sample were the pupils assigned to the various classes of the classroom supervisors of student teachers during the five semester period these data were collected.

The original sample of 82 student teachers was reduced to obtain complete data sets. This procedure resulted in data from 79 student teachers being analyzed in

conjunction with research question one while 64 student teachers provided data for research question three. In the case of research question 2, data from 46 student teachers were selected. Here, 23 student teachers in the total sample whose data records were filled were classified as non-majors. In order to balance the sample, 23 education majors were randomly selected from the remaining candidates who were classified as majors.

Instrumentation

While a variety of scales and criterion-referenced instruments were used to obtain measures of independent and dependent variables for program evaluation purposes, data requirements for this inquiry were met by the summary evaluation of unit form. This form requires an estimate of the achievement level and socioeconomic level of the learners in addition to the actual number of class periods required to teach the unit. Perhaps the most significant information collected among all data is recorded on this form by the student teacher; this data being achievement information (learner attainment of individual unit objectives, pretest scores, and unit posttest scores). Criterion-referenced tests developed by the student teacher are used to provide these learner attainment data. These instruments, unique for each unit and each student teacher, represent a strength yet potential limitation in the design of this investigation. As a strength, the student teacher, with guidance from classroom and university supervisors, develops tests related directly to the outcomes established for the performance objectives in each unit. Prior learning, extenuating classroom situations, and the abilities of the learners are taken into account in establishing both the objectives and the corresponding criterion tests. Under these conditions, the cognitive attainment measure indeed should sample the behavior called for by the performance objectives of the unit.

A potential limitation of candidate-developed criterion-referenced tests stems primarily from the lack of information on the reliability and validity of the respective instruments. Conventional reliability procedures appropriate for

norm-referenced tests are not determined on the various criterion-referenced tests because the function of these tests (to determine an examinee's level of functioning with respect to a stated criterion) is not consistent with the function of norm-referenced tests (determine an individual's performance with respect to the performance of others in the group) (Millman, 1974). Thus, although we are concerned, we are not unduly alarmed by the absence of these values. Validity of criterion-referenced instruments on the other hand, can be assessed by determining the logical relation of the performance objectives and the individual test items. Fortunately, this validity check was conducted by the classroom and university supervisors on each candidate's test before the instrument was administered to learners.

While the preceding remarks are reasonable, we do realize measurement concerns regarding the equivalence of the criterion-referenced testshave not been addressed. Certainly no claim can be made that all of these instruments were designed to measure attainment of identical content; however, it was possible to determine whether the levels of cognitive functioning (knowledge and application) addressed in the tests were nearly uniform. A preponderance of objective type test items designed to measure the knowledge level of functioning occurred. Application level test items occurred, but invariably these questions represented only a small portion of items on the examinations. This finding isn't too suprising, since lower level objectives are more reliably measured by objective type test items. Further, the candidates in this investigation tended to require extensive products, such as, term papers and comprehensive laboratory reports when higher order cognitive objectives were included in the unit.

Data Analysis

Regression procedures were used to address the research questions for this inquiry. Three structural equations taking the form of regression models to represent the estimation requirements for the variables being considered are presented in figure 1.

model 1: $y = \sum_{j=1}^{4} c_j C_j + E(1)$

model 2: $y = mM + E(2)$

model 3: $y = \sum_{h=1}^{3} r_h R_h + E(3)$

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y = learner cognitive attainment on the second instructional unit developed and taught by a student teacher.

c_j = least squares weight associated with each teaching field variable.

C_1 = 1 if the student teacher taught social studies, zero otherwise.

C_2 = 1 if the student teacher taught physical science, zero otherwise.

C_3 = 1 if the student teacher taught English, zero otherwise.

C_4 = 1 if the student teacher taught mathematics, zero otherwise.

C_5 = 1 if the student teacher taught biological science, zero otherwise.

$E(q)$ = the error-of-prediction vector for model q.

m = least squares weight associated with major of student teacher.

M = undergraduate major of student teacher, 1 if the student teacher was an education major, zero otherwise.

r_h = least squares weight associated with grade point ratios of student teachers.

R_1 = professional education coursework grade point ratio.

R_2 = teaching field one grade point ratio.

R_3 = teaching field two grade point ratio.

Figure 1

Three Regression Models for Assessing Whether Student Teacher Characteristics Influence Cognitive Attainment of Learners.

In model 1, learner cognitive attainment on a second unit developed and implemented by a student teacher is influenced by the teaching field of the teaching candidate. Inherent in this regression model is the assumption that the effect of an instructional unit is independent of the student teacher's major, and collegiate academic performance.

Model 1 has been included in this set of equations to specifically address research question one. If learner cognitive attainment of student teachers is a viable criterion for assessing student teachers, some degree of stability should occur across teaching fields of these teaching candidates. This model permits an examination of this concern.

Model 2 presents learner cognitive attainment on an instructional unit taught by a student teacher as a function of the undergraduate major of the student teacher. Underlying this model is the assumption that the quantity of professional education coursework completed by the student teacher affects the quality of their teaching. That is, majors in education who have completed more education hours that non-majors will produce greater cognitive attainment values among their learners than will non-majors. If this assumption is valid, empirical evidence will be generated from this model to support Smith and Street's (1980) contention that more professional education instructional time is needed in the preparation of teachers.

In model 3, learner cognitive attainment depends on the past academic performance of the student teacher. Specifically, this model addresses the influence of student teachers' past coursework performances in professional education and teaching fields on the cognitive attainment of their learners. Justification for the presence of these variables in model 3 is based on assumed positive relations among earned grades and knowledge of the student teacher. Knowledge of the teacher regarding the subject being taught have been shown to influence the achievement of learners (Denton,Kracht, McNamara, 1980). If model 3 does account for substantial variance among learner cognitive attainment values with higher GPR's being associated with greater attainment, Watts' (1980) position for higher admission standards regarding academic standards will be enhanced.

FINDINGS

The analysis associated with research question one yielded a non-significant F value (F = 0.97, df 4,74). This finding indicates the teaching field or content being taught by the student teacher has little influence on learner cognitive attainment of performance objectives. This test, summarized in table I, lends support to the idea that student teacher performance can be assessed across different teaching fields or content areas using learner cognitive attainment as the criterion variable. This recommendation appears to be justified since learner performances are similar when examined across content areas ranging from 63.9 (Biological Science) to 73.0 (Mathematics).

Table I
Statistical Summary of Teaching field Influence on Learner Cognitive Attainment (Research Question One)

Social Studies			Physical Science			English			Mathematics			Biological Science		
n	$\bar{X}$	S.D.	n	$\bar{X}$	S.D.	n	$\bar{X}$	S.D.	n	$\bar{X}$	S.D.	n	$\bar{X}$	S.D.
17	65.00	13.87	19	64.95	15.75	12	70.08	11.87	12	73.00	17.89	12	63.92	14.36

Multiple R	.22	ANOVA for Model	df	MS	F
R^2	.05	Teaching fields	4	225.59	0.97
Std. Error	15.25	Error	74	232.61	

The statistical analysis associated with research question two has yielded different results. The statistical test of this comparison (F = 3.18, df 1,44) indicates the explanatory power (7 percent of the variance)of the student teacher's academic major does influence learner cognitive attainment. This effect can also be observed by examining the average attainment of learners grouped by the major of the student teacher, that is, 71.04 and 62.96 for majors and non-majors respectively. These data are summarized in the following table. Apparently the amount of professional education coursework completed by the student teacher does influence her effectiveness in the classroom.

TableII

Statistical Summary of the Influence of Student Teacher's Academic Major on Learner Cognitive Attainment (Research Question Two)

education major			non education major		
n	$\bar{X}$	S.D.	n	$\bar{X}$	S.D.
23	71.04	16.02	23	62.96	14.74

multiple R	.26	ANOVA for model	df	MS	F
R^2	.07	Major	1	752.09	3.18
Std. Error	15.39	Error	44	236.86	

Yet other factors such as past academic accomplishments (GPR's) may contribute to this difference. Grade point ratios for education majors and non-education majors are as follows: professional education GPR: Ed = 3.54, Non-Ed. = 3.63, Teaching Field One GPR: Ed. = 3.15, Non-Ed. = 2.94; Teaching Field Two GPR: Ed. = 3.03 Non-Ed. = 3.07. The similarity among these values appears to negate academic accomplishment as a factor contributing to the observed difference found in the analysis associated with research question two.

The final analysis of this inquiry addressed research question three, with the predictors being the student teacher's grade point ratios and the criterion being learner cognitive attainment. The test of significance for this regression model (F = 0.23, df: 3, 60) indicates the model's specification was not sufficient to capture variations among learner cognitive attainment values. Examined from a different perspective, table III indicates grade point ratios of the student teacher associated with teaching fields and professional education do not influence learner cognitive attainment.

Table III

Statistical Summary of the Influence of the Student Teacher's Academic Performance on Learner Cognitive Attainment (Research Question Three)

Professional Education GPR		Teaching Field One GPR			Teaching Field Two GPR	
$\bar{X}$	S.D.	$\bar{X}$	S.D.		$\bar{X}$	S.D.
3.58	.39	3.06	.39		3.06	.43
Multiple R	.11	ANOVA for Model		df	MS	F
R^2	.01	Grade Point		3	54.64	0.23
Std. Error	15.41	Error		60	240.31	

Zero-order correlations of learner cognitive attainment with student teacher grade point ratios from professional education, teaching field one, teaching field two are .05, .06, and -.03 respectively. Since these candidates were responsible for meeting or exceeding a grade point ratio of 2.25 in their teaching fields and professional education courses it is possible little variation in GPR's occurred. Examining the maximum and minimum values for each GPR determination has revealed the following range intervals: Professional education, 1.75; teaching field one, 1.67; teaching field two, 1.71. These values represent over 40% of the maximum variation, thus it is doubtful the existing GPR standards of our program have drastically influenced these findings.

DISCUSSION

As stated at the beginning of this paper, our objective has been to determine whether learner cognitive attainment data are influenced by academic characteristics of the student teacher. For the sake of this inquiry, academic characteristics were limited to the content area taught by the student teacher, whether or no she is an education major, and her grade point ratios in professional education and teaching fields. Linking these characteristics with a desired outcome of the teaching candidate's teaching skills, i.e., learner cognitive attainment, has been possible because of the implementation of a data collection strategy based in the

contract plan of McNeil and Popham (1973). We have assumed learner cognitive attainment is an important and viable basis for assessing student teacher competence and have designed an inquiry based on this assumption..

Research question one addressed the effect of the student teacher's teaching field on learner cognitive attainment. The results of this analysis indicate that learner cognitive attainment is relatively stable across some five teaching fields. This finding provides support for the practice of assessing student teacher competence in terms of learner cognitive attainment. Since similar cognitive attainment values occurred across the teaching fields in this inquiry, apparently the instructional system which includes performance objectives and criterion-referenced tests can be successfully implemented in different subject areas.

The influence of the student teacher's academic major on learner cognitive attainment was addressed in research question two. The observed difference in learner performance favoring student teachers majoring in education is an unexpected finding. While a number of factors may be responsible for this difference, we know that academic performances based on grade point ratios are not among them. Perhaps Smith and Street (1980) are correct in their assertion that more instructional time is needed to adequately prepare teachers. Certainly the quantity of professional education coursework completed varies between education majors and non-education majors in the secondary preparation programs at Texas A&M University. Education majors are required to complete some thirty-four semester hours of professional education coursework while non-majors complete twenty-three semester hours. Topics from adolescent psychology, educational media and materials design, structure of knowledge for teaching, and an early field experience are included in the eleven hours required of education majors but not

required for non-majors who are seeking teacher certification. Our findings certainly do not permit more than hopeful conjectures regarding the contribution of these program experiences on learner cognitive attainment, but they do serve to illustrate the need for additional research in this area of teacher education.

The final research question addressed the effect of past academic performances of the student teacher on learner cognitive attainment. The finding that only one percent of the variance in learner attainment can be explained by the student teacher's grade point ratios indicate GPR's are poor predictors of the student teacher's ability to bring about cognitive growth in their learners. While it does not appear our grade point standards for admission and continuation in teacher education seriously influenced the outcome of this analysis, it is possible that different minimum standards for admission and continuation in teacher education would affect outcomes of similar analyses for other programs. More stringent grade point requirements for program admission would reduce the range of predictor scores and potentially would further diminish the effects of these variables on learner cognitive attainment. Conversely, admission and continuation criteria for teacher education devoid of GPR standards, would increase the possible range of predictor values and would increase the impact of GPR's on learner cognitive attainment. However, the results of this inquiry suggest little is to be gained by placing special emphasis on grade point ratios of teaching candidates when their success in based on cognitive attainment of their learners. Other factors not addressed in this inquiry obviously account for most of the variation in learner cognitive attainment and need to be explored.

In closing, this inquiry has examined the influence of a number of academic characteristics of student teachers on subsequent learner cognitive attainment. Lack of statistical differences regarding teaching fields on learner cognitive attainment may signal the generalizability of this approach as a viable assessment procedure for student teachers in a variety of programs, settings, and teaching

fields. The observation that learners of education majors attained more cognitive objectives than their peers assigned to non-education majors is welcome news to teacher educators who are being sharply criticized by some writers. These results provide empirical evidence to counter a number of charges leveled by these critics. Finally, the finding that various grade point ratios of a teaching candidate do not predict whether learners of the student teacher will learn may signal the need to rethink admission criteria for teacher education. While policy decisions based on the results of this inquiry would be premature, additional inquiry to replicate and expand these findings is encouraged.

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